

Claims

1. Tampon (230) for feminine hygiene, with a tapered introductory end (232), a withdrawal end (234) provided with a withdrawal means (56) and a longitudinal axis (x), comprising a longitudinally extending absorbent body made from compressed fiber material, the absorbent body being densified more intensely in the region of the longitudinal axis (x) and forming a fiber column (236), from which longitudinal ribs (238) extend radially outward and flank longitudinal ribs (240) in pairs,
characterized in that
the tapered introductory end (232) being formed by the fiber column (236), the longitudinal grooves (240) and longitudinal ribs (238) is provided with collecting grooves (242) and collecting ribs (244) to collect menstrual secretions, wherein the collecting grooves (242) are open axially to the front and radially outward and wherein the collecting ribs (244) flank the collecting grooves (242) in pairs.
2. Tampon of Claim 1, characterized in that the collecting grooves (242) transition continuously into the longitudinal grooves (240) and the collecting ribs (244) transition continuously into the longitudinal ribs (238) at the end of the tapered introductory end (232).
3. Tampon of Claim 1, characterized in that a front end of the collecting grooves (242) in the fiber column (236) has an approximately V-shaped cross section.
4. Tampon of Claim 1, characterized in that collecting grooves (242) have a substantially trough-shaped cross section and the collecting ribs (244) have a narrow cross section being tapered outward.
5. Tampon of Claim 1, characterized in that a middle longitudinal portion of the collecting grooves (242) has a greater width than the

longitudinal grooves (240) and that the collecting ribs (244) are more intensely densified than the longitudinal ribs (238).

- 5 6. Tampon of Claim 1, characterized in that the inner width of the collecting grooves (242) is about 1.0 to 2.5 mm.
- 10 7. Tampon of Claim 1, characterized in that the cross section of the longitudinal grooves (240) is slightly undercut and that they form, in transverse profile, collecting pockets (280), and that the longitudinal ribs (238) have a slightly T-shaped transverse profile (265).
- 15 8. Tampon of Claim 1, characterized in that the longitudinal grooves (240) have a slightly undercut transverse profile of a collecting pocket (280) from the rear end of the tapered introductory end (232), wherein said undercut transverse profile is increasingly drop-shaped (250) toward the withdrawal end (234), wherein the longitudinal grooves (242) are increasingly narrower at the circumferential surface (245) of the tampon (230) and are closed in the region of a security zone (254) at the withdrawal end (234) to form axially parallel collecting channels (248), which are closed by the fiber material of the security zone (254) in front of the withdrawal end (234).
- 20 9. Tampon of Claim 8, characterized in that the drop-shaped transverse profile (250) of the longitudinal grooves (240) are radially expanded toward the fiber column (236).
- 25 10. Tampon of Claim 1, characterized in that the fiber column (236) is pressed approximately cylindrically along its entire length.
- 30 11. Tampon of Claim 1, characterized in that the longitudinal grooves (240), longitudinal ribs (238) and collecting channels (248) extend approximately parallel to the tampon axis (x).

12. Tampon of Claim 1, characterized in that the longitudinal grooves (240), longitudinal ribs (238) and collecting channels (248) extend spirally or helically around the longitudinal axis (x) of the tampon (230).
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13. Tampon of Claim 1, characterized in that the longitudinal grooves (240), longitudinal ribs (238) and collecting channels (248) extend over an circumferential angle (β) of up to 190°.
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14. Tampon of Claim 1, characterized in that some of the longitudinal grooves (242) end at the security zone (254).
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15. Tampon of Claim 1, characterized in that the longitudinal ribs (238) are radially pressed less intensive radially in the region of the security zone (254).
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16. Tampon of Claim 1, characterized in that the fiber material of the longitudinal ribs (238) is pressed increasingly less intensive radially from the introductory end (232) up to the region of the withdrawal end (234) and therefore is smoother at the circumferential surface (245) of the tampon (230) than at the introductory end (232).
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17. Tampon of Claim 1, characterized in that the fiber material of the security zone (254) is hydrophobically impregnated.
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18. Tampon of Claim 1, characterized in that the axial length of the security zone (254) is 5 to 15 mm.
19. Tampon of Claim 1, characterized in that a finger recess (56) is axially pressed into the withdrawal end (234) of the tampon (230), wherein the intensely densified fiber material of the finger recess (56) closes the end of the collecting channels (248) extending up to

the withdrawal end (234).

20. Tampon of Claim 19, characterized in that the axial length of the more intensely densified fiber material of the finger recess (56) is up to approximately 5 mm.
21. Tampon of Claim 1, characterized in that the outer surface of the tampon (230) is at least partially covered by fluid-permeable cover.
22. Tampon of Claim 21, characterized in that the cover consists of a non-woven layer.
23. Tampon of Claim 21, characterized in that the cover consists of a perforated foil.
24. Tampon of Claim 21, characterized in that the cover is a hydrophobic cover.
25. Tampon of Claim 1, characterized in that the circumferential surface (254) of the tampon (230) is substantially cylindrical.
26. Process for manufacturing a tampon for feminine hygiene, comprising steps as follows:
- Providing a tampon blank comprising a longitudinally extending strip of random fiber material, the length of the tampon blank corresponds substantially to the length of the tampon (230),
 - pressing the tampon blank to a preform (406) of a round cross section with a more intensely densified fiber column (236) in the region of the longitudinal axis (x) of the preform (406) and forming substantially longitudinally extending grooves (240) and ribs (238) alternating in circumferential direction at an outer circumferential surface (245) of the preform (406), and
 - tapering the introductory end (232) of the tampon (230),

- characterized in that
to finalize the tampon (230) the fiber column (236), the longitudinal
grooves (240) and longitudinal ribs (238) are formed during their
tapering into collecting grooves (242) and collecting ribs (244) at a
5 front end (232) of a preform (406), wherein the collecting grooves
(242) are open axially to the front and radially outward.
27. Process of Claim 26, characterized in that the fiber column (236),
the longitudinal grooves (240) and the longitudinal ribs (238) are
10 formed at the introductory end (232) such that the collecting grooves
(242) transition continuously into the longitudinal grooves (240) and
the collecting ribs (244) transition continuously into the longitudinal
ribs (238).
- 15 28. Process of Claim 26, characterized in that the front ends of the
collecting ribs (244) impressed into the fiber column (236) have a V-
shaped cross section.
29. Process of Claim 26, characterized in that the collecting grooves
20 (242) and the collecting ribs (244) are pressed in such a manner that
the collecting grooves (242) obtain a trough-shaped cross section
and the collecting ribs (244) obtain a narrow, outwardly tapered
cross section.
- 25 30. Process of Claim 26, characterized in that the collecting grooves
(242) are pressed with a greater width than the longitudinal ribs
(240) in their trough-shaped middle region and that the collecting
ribs (244) are more intensely pressed than the longitudinal ribs
(240).
- 30 31. Process of Claim 26, characterized in that the collecting grooves
(242) are formed with an inner width of about 1.0 to 2.5 mm.
32. Process of Claim 26, characterized in that in step b) at least some of

the longitudinal grooves (240) and longitudinal ribs (238) are pressed along the entire length of the tampon blank, such that the transverse profile (250) of the longitudinal grooves (240) is slightly undercut and that the transverse profile of the longitudinal ribs (238) is formed into a slight T-shape, wherein the longitudinal ribs (238) is pressed less intensively radially at least on a longitudinal portion of the tampon blank associated with the outlet end (412) of the press (404), so that the tampon blank has a greater diameter at least on this longitudinal portion (254) and that, thereafter, the radial outer ends (246) of at least these longitudinal ribs (238) are radially compressed by exerting a slight concentric pressure, such that the tampon blank is reduced to a final diameter of the preform (406), wherein the width of the outer ends of the longitudinal ribs (238) being positioned at the circumferential surface (245) of the preform (406) and being similar to a T-beam (246) are enlarged and thereby the width of the pocket-shaped transverse profile (250) of the longitudinal grooves (240) is reduced at the circumferential surface (245) of the preform (406), so that the transverse profile of the longitudinal grooves (240) forms a collecting pocket (280) and the longitudinal grooves (240), of which at least the rear longitudinal portion (254) associated with the withdrawal end (234) is pressed less intensively, are closed by said concentric pressure to a reduced diameter of the preform (406) to form collecting channels (248) and a security zone (254) having parallel axes within the preform (406), and that the fiber material within said security zone (254) is uniformly densified along the cross section of the preform (406), such that the collecting channels (248) are increasingly closed within the security zone (254).

33. Process of Claim 26, characterized in that the longitudinal grooves (240) are pressed, such that the drop-shaped transverse profile (250) of the longitudinal grooves (240) and of the collecting channels (248) is expanded radially to the fiber column (236).

34. Process of Claim 26, characterized in that the longitudinal grooves (240), longitudinal ribs (238) and collecting channels (248) are pressed approximately parallel to the tampon axis (x).
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35. Process of Claim 26, characterized in that the longitudinal grooves (240), longitudinal ribs (238) and collecting channels (248) are pressed, such that they extend spirally or helically around the longitudinal axis (x) of the tampon (230).
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36. Process of Claim 35, characterized in that the longitudinal grooves (240), longitudinal ribs (238) and collecting channels (248) are pressed over a circumferential angle (β) of up to 190°.
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37. Process of Claim 26, characterized in that some of the longitudinal grooves (40) are pressed, such that the longitudinal grooves (40b) end at the security zone (254).
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38. Process of Claim 26, characterized in that hydrophobically impregnated fiber material is used for the security zone (254).
39. Process of Claim 26, characterized in that the security zone (254) is pressed over an axial length of 5 to 15 mm.
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40. Process of Claim 26, characterized in that a finger recess (56) is impressed axially into the withdrawal end (234) of the preform (406), such that the more intensely pressed fiber material of the finger recess (56) closes the end of the collecting channels (248) extending into the security zone (254).
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41. Process of Claim 40, characterized in that the fiber material of the finger recess (56) is pressed more intensely over an axial length of up to 5 mm.

42. Process of Claim 26, characterized in that the absorbent body is surrounded by a cover of fluid-permeable material before it is pressed.
- 5 43. Process of Claim 42, characterized in that non-woven material is used as fluid-permeable material for the cover.
- 10 44. Process of Claim 43, characterized in that a perforated foil is used as fluid-permeable material for the cover.
45. Process of Claim 44, characterized in that hydrophobic material is used for the cover.
- 15 46. Process of Claim 26, characterized in that the absorbent body is manufactured from a longitudinally extending strip of fiber fleece provided with a withdrawal cord (58), said strip of fiber fleece having a determined length and a width corresponding to the length of the tampon (230) and being wound up upon itself to form the tampon blank (406).
- 20 47. Process of Claim 46, characterized in that, before the fiber fleece is wound up upon itself, a front end of a strip of cover material is secured at an end of the strip of fiber fleece, the length of said strip of cover material being greater than the circumferential length of the tampon (230) and the rear end of the cover material being sealed to that cover material covering the circumferential surface of the tampon (230) during the winding up of the strip of fiber fleece.
- 25 48. Apparatus (400) for manufacturing a tampon (230), having a device (414) for feeding an absorbent body as a tampon blank consisting of random fiber material, the length of the tampon blank corresponds to approximately the length of the tampon (230), to
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- a press (404) having an inlet side (412) and an outlet side (420) and pressing jaws (450) of identical dimensions, which are positioned in a star-shaped arrangement relative to central press axis (y) and which are movable radially synchronously in a common plane relative to the press axis (y) between their open position and closed position and which support each other at their opposite longitudinal sides (452, 454) in their closed position;
- a stepped pressing surface (458) at each of said pressing jaws (450), wherein
- the pressing surfaces (458) of the pressing jaws (450) form a press opening (415) of round cross section; and
- each of said pressing surfaces (458) is provided with a pressing knife (460) being directed to the pressing opening (415), and a pressing shoulder (462) being positioned only at a determined side (490) of the pressing knife (460) and being directed in the same circumferential direction around the press axis (y);
- the pressing shoulder (462) is outwardly set off against a pressing edge (464) at the free, inner end of the pressing knife (460) relative to the press axis (y);
- a surface formed by the pressing shoulder (462) is greater than a surface being formed by a pressing edge (464) of the pressing knife (460);
- an injection device is provided with a discharge rod (418), which is coaxially movable to and fro to the pressing opening (415);
- a transportation device (422) being step-wise movable with cylindrical transportation sleeves (428) being secured in identical transportation distances at the transportation device (422), wherein said transportation sleeves (428) being open at both ends and having a diameter substantially corresponding to that of a preform (406) that is ejected from the press (404) can be positioned at the outlet side of the press (404) coaxially to the press axis (y) to receive a preform (406);
- a final forming station (410) has a dome former (446) being axially

- movable to and fro, the front face of which is provided with a concavely tapered depression (448), in front of which one of both of said open ends of one of each transportation sleeve (428) carrying a preform (406) can be positioned step-wise and coaxially for tapering the introductory end (232) of the preform (406), and said final forming station has a recess former (442) being movable coaxially to the dome former (446) through the other of both of said ends of the transportation sleeve (428) against the withdrawal end (234) of the preform (406),
- characterized in that
- the wall of the concavely tapered depression (448) in the dome former (446) is provided with pressing ribs (438) and pressing grooves (440) alternating in circumferential direction, such that the introductory end (232) of the preform (406), during tapering, is provided with collecting grooves (242) being open axially and radially outward and collecting ribs (244) projecting outward axially and radially.
49. Apparatus of Claim 48, characterized in that the facing ribs and pressing grooves (440) are positioned in alignment with the pressing knives (460) and pressing shoulders (462) of the pressing jaws (450).
50. Apparatus of Claim 49, characterized in that the pressing ribs (438) have an inverted V-shaped transverse profile at their inner end close to the longitudinal axis of the dome former (446).
51. Apparatus of Claim 48, characterized in that the pressing ribs (438) have a wedge-shaped profile with a broad pressing edge in the midst of its length.
52. Apparatus of Claim 48, characterized in that the width of the transverse profile of the pressing ribs (438) are larger dimensioned in a middle region of its length than the width of the pressing

surfaces (458) of the pressing jaws (450).

53. Apparatus of Claim 48, characterized in that the pressing ribs (438) have a width of about 1.5 to 3.0 mm.

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54. Apparatus of Claim 48, characterized in that all press jaws (450) have a transverse profile at the inlet side (412) of the press (404) that consists of a wedge-shaped pressing knife (460) and a narrow pressing shoulder (462), and

10 that the transverse profile gradually transitions at least over a partial length of the pressing jaws into a narrow pressing knife (460), the transverse profile of which has a drop-shape at its free radial end (464) and transitions into a relatively broad pressing shoulder (462), wherein the drop-shaped transverse profile (468) is largest at a

15 radially inner, free pressing edge (464) of the pressing knife (460).

55. Apparatus of Claim 48, having a device (408) for reducing the diameter of the preform (406) to a final diameter of the tampon (230), wherein the diameter reduction device (408) is associated with the outlet side (420) of the press and is provided with a conically tapered forming channel (522), which is provided with forming ribs (502), being positioned in alignment with the pressing knives (460), and wherein the diameter reduction device (408) has a diameter at the outlet side (420), which corresponds approximately
- 20 to the final diameter of the preform (406),

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characterized in that

the press (404) is extended over a length of at least 40 to 70 mm toward its outlet side (420), and the diameter reduction device (408) for the pressed preform (406) is integrated in the region of this extension (502) of the press (404), wherein the pressing knives (460) and pressing shoulders (462) of the pressing jaws (450) extend continuously into the diameter reduction device (408) and form forming jaws (518) with forming ribs (502) and forming grooves (504) of the diameter reduction device (408), in which the

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ends of the forming jaws (518), in the closed state of the press (404), define a forming cone (514) at the outlet side (420) of the diameter reduction device (408), the diameter of the forming cone (514) corresponding approximately to the final diameter of the preform (230).

56. Apparatus of Claim 48, characterized in that at least some of the pressing knives (460) extend from the inlet side (412) of the press (404) up to the region of the outlet side (420) of the press (404).
57. Apparatus of Claim 48, characterized in that, in the closed state of the press (404), the pressing edges (464) of the pressing knives (460) surround a cylindrical envelope curve (496).
58. Apparatus of Claim 48, characterized in that, in the closed state of the pressing jaws (450), a short axial longitudinal portion (516) of the pressing shoulders (462) surrounds an imaginary envelope curve at the inlet side (412) of the press (404), the cross section of said envelope curve being larger dimensioned than a cross section of an imaginary envelope curve surrounding the pressing shoulders of a remaining, longer longitudinal portion (520).
59. Apparatus of Claim 48, characterized in that, in the closed state of the press (404), the imaginary envelope curve of the short, axial longitudinal portion (516) of the pressing shoulders (462) is cylindrical.
60. Apparatus of Claim 48, characterized in that, in the closed state of the press (404), the imaginary envelope curve of the short axial longitudinal portion (516) of the pressing shoulders (462) is conically expanded toward the outlet side (412) of the press (404).
61. Apparatus of Claim 48, characterized in that, in the closed state of the press (404), the pressing shoulders (462) of the pressing jaws

(452) extending between the inlet side (412) of the press (404) and the diameter reduction device (408) positioned at the outlet side (420) of the press (404) over a press-effective region (520) surround a conical envelope surface (508) expanding to the outlet side (420) of the press (404).

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62. Apparatus of Claim 48, characterized in that the pressing knives (460) of the pressing jaws (450) are spirally formed around the press axis (y).

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63. Apparatus of Claim 62, characterized in that the circumferential angle (β) of the spiral press knives (460) is 120° to 190° .

64. Apparatus of Claim 48, characterized in that a rod-shaped recess former (442) is positioned at a distance coaxially opposite of the dome former (446) and movable to and fro in the final forming station (410), such that the dome former (446) and the recess former (442) are at the same time movable against one of both ends (232, 234) of the preform (406) to impress collecting grooves (242) and collecting ribs (244) into the introductory end (232) and to impress a finger recess (56) into the withdrawal end (234) of the preform (406).

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